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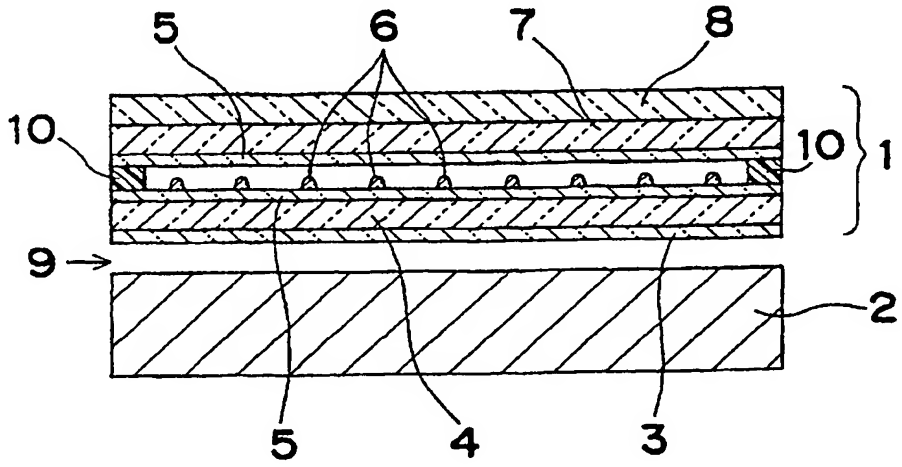
(54) Title: LOW REFLECTION TOUCH PANEL

(57) Abstract

The touch panel (1) includes at least a first quarter-wave plate (4), two transparent conductive films (5) opposite to each other via spacers (6), a second quarter-wave plate (7), and a polarizing plate (8) arranged sequentially from the side of a liquid crystal display (2), including a reflection-preventing filter of a circular polarization type (7, 8), in which a low reflection treatment (3) is executed to a rear face of the first quarter-wave plate (4) with the rear face opposed via an air layer (9) to a front face of the liquid crystal display (2).



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DESCRIPTION

Low Reflection Touch Panel

Technical Field

The present invention relates to a low reflection touch panel which restricts reflection at an interface between a rear face of a first quarter-wave plate thereof and an air layer and exerts a superior visibility.

Background Art

Conventionally, a liquid crystal display widely employed in word processors, notebook personal computers, PDAs (personal digital assistants), and the like products has a touch panel arranged in front thereof. The touch panel is constituted in a structure in which two transparent plates with transparent conductive films are disposed in a manner that the conductive films face each other via spacers. Both transparent conductive films insulated via the spacers are brought in touch with each other thereby being electrically connected when part of a surface of the panel is pressed for input. However, in the case where the touch panel is used in a room lighted with a fluorescent lamp or outdoors, the panel reflects some extraneous light at faces of the transparent conductive films, thus impairing a visibility of its display screen.

For solving the above issue, the Japanese Unexamined Patent Publication No. 10-48625 proposes a touch panel comprising a first quarter-wave palate 104, two transparent conductive films 105 opposed via spacers, a second quarter-wave plate 107, and a polarizing plate 108 sequentially arranged from the side of a liquid crystal display 102 (referring to Fig. 5). The second quarter-wave plate 107 and the polarizing plate 108 constitute a reflection-preventing filter of a circular polarization type to efficiently eliminate reflection of the external light at the transparent conductive films 105. Since a linearly polarized light entering from the side of a liquid crystal display 102 for display use is also changed to a circularly polarized light if there is only one second quarter-wave plate 107, the first quarter-wave plate 104 having an optical axis orthogonal to that of the second quarter-wave plate 107 is arranged between the transparent conductive films 105 and the liquid crystal display 102, thereby offsetting phases. More specifically, the light entering from the side of the liquid crystal display is, after circularly polarized by the first quarter-wave plate 104, returned to the original linearly polarized light by the second quarter-wave plate 107.

The above touch panel and the liquid crystal display 102 are generally bonded by a double-coated

adhesive tape or the like or united by the like manner at outside a display area, with an air layer 109 defined therebetween to prevent generation of blurs or distortion to a display image in the presence of tight adhesion of the touch panel and the liquid crystal display 102 when a liquid crystal of the liquid crystal display 102 is compressed in a thicknesswise direction at an input point.

Forming the air layer 109 between the touch panel and the liquid crystal display 102 causes reflection of the extraneous light at an interface between a lowest face of the touch panel and the air layer 109. What's worse, the first quarter-wave plate 104 interposed between the reflection-preventing filter constituted of the second quarter-wave plate 107 and the polarizing plate 108 and the lowest face of the touch panel obstructs the reflection-preventing filter from shielding the reflected light.

Disclosure Of Invention

An object of the present invention is to provide a low reflection touch panel which can solve the above inconvenience and restrict reflection of light at an interface between a rear face of a first quarter-wave plate thereof and an air layer and exerts a superior visibility.

In accomplishing these and other aspects, according to a first aspect of the present invention, there is provided a low reflection touch panel which is to be

placed on a liquid crystal display, the touch panel comprising: a first quarter-wave plate; two transparent conductive layers opposed to each other via spacers; a second quarter-wave plate; and a polarizing plate sequentially arranged from a side of the liquid crystal display,

wherein a reflection-preventing filter of a circular polarization type is constructed by the polarizing plate and the second quarter-wave plate, and the low reflection touch panel has low reflection treatment at a rear face of the first quarter-wave plate which is a lowest layer of the low reflection touch panel with the rear face of the first quarter-wave plate opposed via an air layer to a front face of the liquid crystal display.

According to a second aspect of the present invention, there is provided a low reflection touch panel according to the first aspect, wherein a low reflection treatment layer for restricting reflection at an interface between the rear face of the first quarter-wave plate and the air layer is directly provided at the rear face opposed via the air layer to the front face of the liquid crystal display so that the low reflection touch panel has the low reflection treatment.

According to a third aspect of the present invention, there is provided a low reflection touch panel

according to the first aspect, wherein a low reflection treatment layer for restricting reflection of external light at an interface between the rear face of the first quarter-wave plate and the air layer and reflection of light passing through the liquid crystal display at the rear face of the first quarter-wave plate is directly provided at the rear face opposed via the air layer to the front face of the liquid crystal display so that the low reflection touch panel has the low reflection treatment.

According to a fourth aspect of the present invention, there is provided a low reflection touch panel according to any one of the first to third aspects, further comprising an optically isotropic transparent plate interposed between one of the first quarter-wave plate and the second quarter-wave plate and the transparent conductive film.

According to a fifth aspect of the present invention, there is provided a low reflection touch panel according to any one of the first to third aspects, further comprising a first optically isotropic transparent plate interposed between the first quarter-wave plate and the transparent conductive film and a second optically isotropic transparent plate interposed between the second quarter-wave plate and the transparent conductive film.

Brief Description Of Drawings

These and other aspects and features of the present invention will become clear from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is a sectional diagram of a low reflection touch panel according to an embodiment of the present invention when arranged in front of a liquid crystal display;

Fig. 2 is a sectional diagram of a low reflection touch panel according to another embodiment of the present invention when arranged in front of a liquid crystal display;

Fig. 3 is a sectional diagram of a low reflection touch panel according to a still another embodiment of the present invention when arranged in front of a liquid crystal display;

Fig. 4 is a sectional diagram of a low reflection touch panel according to a further embodiment of the present invention when arranged in front of a liquid crystal display; and

Fig. 5 is a sectional diagram of a low reflection touch panel according to the conventional technique when arranged in front of a liquid crystal display.

Best Mode for Carrying Out the Invention

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings.

The present invention will be described in detail with reference to the accompanying drawings.

Figs. 1-4 are sectional diagrams of low reflection touch panels according to embodiments of the present invention when arranged in front of liquid crystal displays. In the drawings, reference numerals respectively represent: 1 a low reflection touch panel, 2 a liquid crystal display, 3 a low reflection treatment layer, 4 a first quarter-wave plate, 5 a transparent conductive film, 6 spacers, 7 a second quarter-wave plate, 8 a polarizing plate, 9 an air layer, 10 a double-coated adhesive tape, and 12-13 optically isotropic transparent plates. The air layer 9 may be defined by fixing a metal or resin frame or case which covers the peripheral edge of the upper surface of the liquid crystal display 2 to the touch panel with a linear or frame-shaped double-coated adhesive tape or the like. Alternatively, the air layer 9 may be defined by interposing a linear or frame-shaped sponge between the touch panel and a metal or resin frame or case which covers the peripheral edge of the upper surface of the liquid

crystal display 2. Also, the air layer 9 may be defined by overlapping the sponge and the linear or frame-shaped double-coated adhesive tape or the like.

The first quarter-wave plate 4 and the second quarter-wave plate 7 have a function of applying a phase shift in time (phase difference) to two components decomposed from a linearly polarized light and orthogonal to each other, thereby changing the linearly polarized light to a circularly polarized light or a nearly circularly polarized light. One polarized component is delayed in phase by a quarter wavelength than the other polarized component. The quarter wavelength corresponds to a quarter of a center wavelength (approximately 550nm) of a visible light range (approximately 400-700nm). Each of the first quarter-wave plate 4 and the second quarter-wave plate 7 is obtained by uniaxially stretching a transparent plate or film of polycarbonate, polyarylate, polyethersulfone, polysulfone, norbornene resin or the like and controlling indices of refraction in an x direction as a stretch direction (direction of an optical axis), a y direction orthogonal to the x direction, and a thicknesswise direction, i.e., z direction orthogonal to the x direction and y direction.

The second quarter-wave plate 7 forms a reflection-preventing filter of a circular polarization

type in combination with the polarizing plate 8 in front thereof. Light from the outside such as indoor fluorescent lamp light, outdoor light or the like becomes a linearly polarized light through the polarizing plate 8, then becomes a circularly polarized light through the second quarter-wave plate 7. Even if the circularly polarized light is reflected by the transparent conductive film 5, the light passes the second quarter-wave plate 7 again to be a linearly polarized light perpendicular to a transmission axis of the polarizing plate 8, so that the reflected light is limited. The second quarter-wave plate 7 used is equipped with flexibility to facilitate inputs by pens or fingers.

Preferably, the first quarter-wave plate 4 and the second quarter-wave plate 7 are arranged to have respective optical axes orthogonal to each other. In the arrangement, the linearly polarized light entering the first quarter-wave plate 4 for use in display from the side of the liquid crystal display 2 is changed to the circularly polarized light after passing through the first quarter-wave plate 4, turned to the linearly polarized light again incident to the passing through the second quarter-wave plate 7, and provides display through the polarizing plate 8.

The polarizing plate 8 placed in front of the

second quarter-wave plate 7 constitutes the reflection-preventing filter of a circular polarization type in combination with the second quarter-wave plate 7. An absorption axis of the polarizing plate 8 placed in front of the second quarter-wave plate 7 is inclined by 45° or 135° to an optical axis of the second quarter-wave plate 7. In general, the polarizing plate 8 is formed by stretching a polyvinyl alcohol film having iodine, a dye, or the like dichromatic pigment impregnated therewith and coating both faces of the film with a cellulose or acrylic protecting film, or by the like manner. A low reflection treatment, an anti-contaminating treatment, a satin finish, or the like may be executed onto the polarizing plate 8. Or a film subjected to the above treatment can be attached onto the polarizing plate 8 via an adhesive or the like. Some of the treatments may be used in combination. For the low reflection treatment, a low reflection material using fluorine resin, silicon resin, or the like is applied, or a metallic multilayer film is formed by vacuum vapor deposition, sputtering, or the like manner. For the anti-contaminating treatment, an anti-contaminating material using fluorine resin or the like can be applied. For the satin finish treatment, sandblasting, embossing, mat coating, etching, or the like may be carried out.

The two transparent conductive films 5 opposed to

each other via the spacers 6 work as electrodes of the touch panel. A material of each of the transparent conductive films 5 is, for example, a thin film of metallic oxide such as tin oxide, indium oxide, antimony oxide, zinc oxide, cadmium oxide, ITO, or the like, or a thin film of metal such as gold, silver, copper, tin, nickel, aluminum, palladium, or the like. For forming the transparent conductive films 5, vacuum vapor deposition, sputtering, ion plating, CVD, or the like method is employed. According to the embodiment of the present invention, the transparent conductive films 5 can be directly formed to the first quarter-wave plate 4 and the second quarter-wave plate 7 respectively (with reference to Fig. 1). As shown in Fig. 2, an optically isotropic transparent plate 12 such as optically isotropic glass plate, optically isotropic resin film, optically isotropic resin plate, or the like may be interposed between one of the first quarter-wave plate 4 and the second quarter-wave plate 7 (for example, in Fig. 2, the first quarter-wave plate 4 and in Fig. 3, the second quarter-wave plate 7) and the transparent conductive film 5. That is, as shown in Fig. 2, the optically isotropic transparent plate 12 is interposed between the first quarter-wave plate 4 and the transparent conductive film 5 with the another transparent conductive film 5 directly formed on the second quarter-wave plate 7.

As shown in Fig. 3, an optically isotropic transparent plate 13 such as optically isotropic glass plate, optically isotropic resin film, optically isotropic resin plate, or the like is interposed between the second quarter-wave plate 7 and the transparent conductive film 5 with the another transparent conductive film 5 directly formed on the first quarter-wave plate 4. Alternatively, as shown in Fig. 4, the optically isotropic transparent plates 12, 13 such as optically isotropic glass plates, optically isotropic resin films, optically isotropic resin plates or the like is interposed between both of the first quarter-wave plate 4 and the second quarter-wave plate 7 and the transparent conductive films 5. Likewise, the satin finish may be executed at least to a front face of one transparent conductive film 5 so as to prevent generation of Newton's rings. The satin finish scatters the light thereby suppressing light interference between the transparent conductive films 5. Also the low reflection treatment is workable at least to a front face of one of the transparent conductive films 5. The optically isotropic transparent plate 12 has a function of improving stability to pressure with fingers or pen and durability of the touch panel. That is, the plate 12 can have such a strength that the plate 12 can prevent the quarter-wave plate from being excessibly bent and being cracked. One example of the

plate 12 is a 0.3-5mm thickness glass plate or resin plate.

The spacers 6 are formed to the front face of either transparent conductive film 5. The spacers 6 can be obtained by forming a transparent photosetting resin into fine dots in a photoprocess. Alternatively, many fine dots may be formed by a print method to obtain the spacers 6. Between members of the low reflection touch panel 1 to which the transparent conductive films 5 are formed directly are bonded only at outside the display area by the double-coated adhesive tape 10 or a transparent adhesive.

The embodiment of the present invention features the low reflection treatment to a rear face of the first quarter-wave plate of the touch panel having the reflection-preventing filter of the circular polarization type which face is opposed to the front face of the liquid crystal display 2 via the air layer 9. This constitution restricts reflection of the external light at an interface between the rear face of the first quarter-wave plate 4 which is the lowest layer of the touch panel and the air layer 9, thereby improving a visibility more. Moreover, reflection of the light passing through the liquid crystal display 2 at the rear face of the first quarter-wave plate 4 which is the lowest layer of the touch panel is restricted, so that a quantity of light passing the liquid crystal display 2 and coming out of the front face of the

touch panel increases the more. The low reflection treatment is achieved by applying a low reflection material using fluorine resin, silicon resin, or the like, or forming a metallic multilayer film by vacuum vapor deposition, sputtering, or the like way. The low reflection treatment is directly executed to the rear face of the first quarter-wave plate 4 which is the lowest layer of the touch panel, thereby forming the low reflection treatment layer 3 at the rear face of the first quarter-wave plate 4.

According to the low reflection touch panel constituted as above, although between the second quarter-wave plate 7 and the polarizing plate 8 in front of the plate 7 should be bonded totally by a transparent adhesive or transparent re-release sheet, it is enough for the other plates to be bonded simply at outside the display area by a double-coated adhesive tape.

The low reflection touch panel of the present invention in the above-described constitution and operation exhibits the following effect.

Specifically, the reflection at the interface between the rear face of the first quarter-wave plate which is the lowest layer of the touch panel and the air layer is restricted and the visibility is enhanced because of the low reflection treatment to the rear face of the first

quarter-wave plate which is a lowest layer of the low reflection touch panel with the rear face of the first quarter-wave plate opposed via the air layer to the front face of the liquid crystal display in the touch panel having the reflection-preventing filter of a circular polarization type.

In other words, the reflection of the lowest face of the touch panel has generally about 4-5% without any low reflection treatment at the rear face of the lowest layer of the touch panel, and then when observing its liquid crystal display through such a touch panel, the display may seem to become whitish because of the reflection at the lower face of the lowest layer of the touch panel. In order to restrict the reflection at the lower face of the lowest layer of the touch panel, according to the present invention, the low reflection touch panel has the low reflection treatment at the rear face of the first quarter-wave plate which is the lowest layer of the low reflection touch panel with the rear face of the first quarter-wave plate opposed via the air layer to the front face of the liquid crystal display, thus, resulting in restricting the reflection of 2% or less as one example. So, the above low reflection treatment preferably means such treatment that the reflection at the lower face of the lowest layer of the touch panel can be restricted to 2% or less.

Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Such changes and modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

CLAIMS

1. A low reflection touch panel which is to be placed on a liquid crystal display (2), the touch panel comprising: a first quarter-wave plate (4); two transparent conductive layers (5) opposed to each other via spacers (6); a second quarter-wave plate (7); and a polarizing plate (8) sequentially arranged from a side of the liquid crystal display (2),

wherein a reflection-preventing filter of a circular polarization type is constructed by the polarizing plate (8) and the second quarter-wave plate (7), and the low reflection touch panel has low reflection treatment at a rear face of the first quarter-wave plate (4) which is a lowest layer of the low reflection touch panel with the rear face of the first quarter-wave plate opposed via an air layer (9) to a front face of the liquid crystal display.

2. A low reflection touch panel as defined in claim 1, wherein a low reflection treatment layer (3) for restricting reflection at an interface between the rear face of the first quarter-wave plate and the air layer is directly provided at the rear face opposed via the air layer to the front face of the liquid crystal display so that the low reflection touch panel has the low reflection treatment.

3 A low reflection touch panel as defined in claim

1, wherein a low reflection treatment layer (3) for restricting reflection of external light at an interface between the rear face of the first quarter-wave plate and the air layer and reflection of light passing through the liquid crystal display at the rear face of the first quarter-wave plate is directly provided at the rear face opposed via the air layer to the front face of the liquid crystal display so that the low reflection touch panel has the low reflection treatment.

4. A low reflection touch panel as defined in any one of claims 1-3, further comprising an optically isotropic transparent plate (12,13) interposed between one of the first quarter-wave plate (4) and the second quarter-wave plate (7) and the transparent conductive film (5).

5. A low reflection touch panel as defined in any one of claims 1-3, further comprising a first optically isotropic transparent plate (12) interposed between the first quarter-wave plate (4) and the transparent conductive film (5) and a second optically isotropic transparent plate (13) interposed between the second quarter-wave plate (7) and the transparent conductive film (5).

Fig. 1

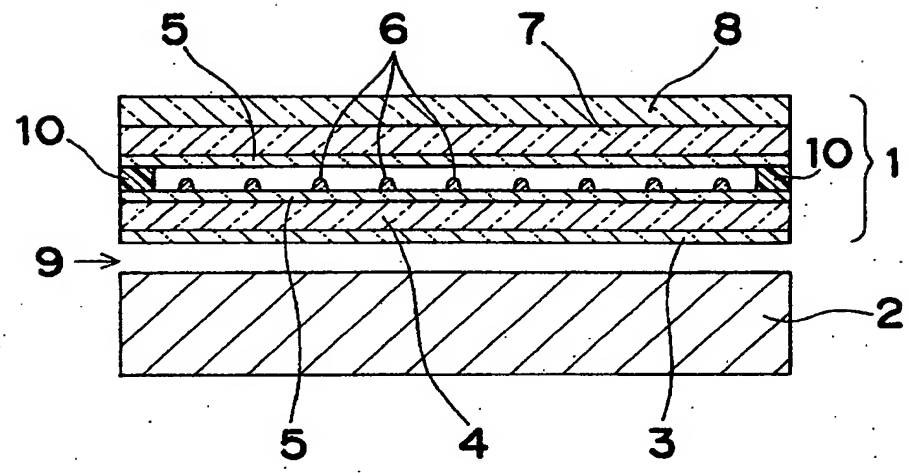


Fig. 2

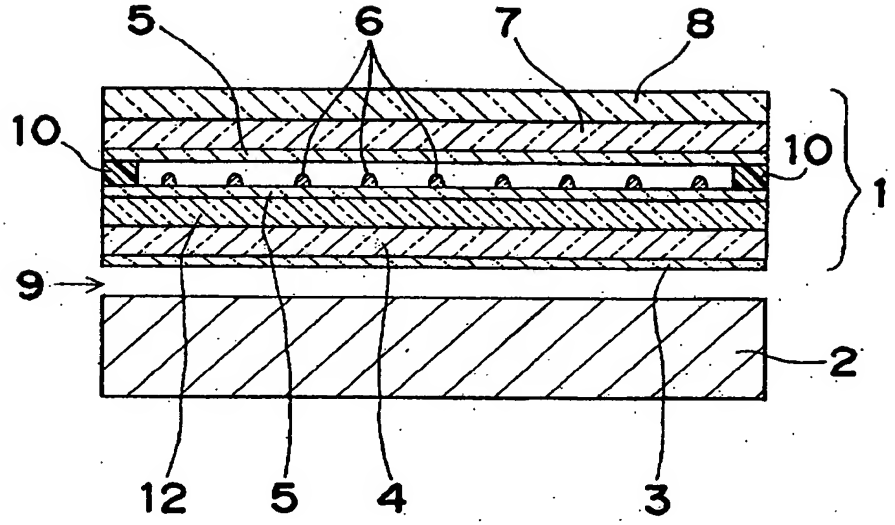


Fig. 3

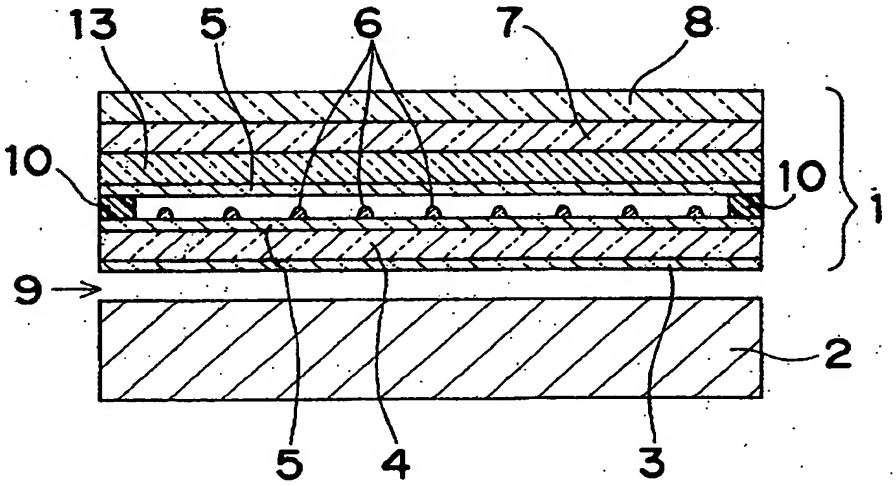


Fig. 4

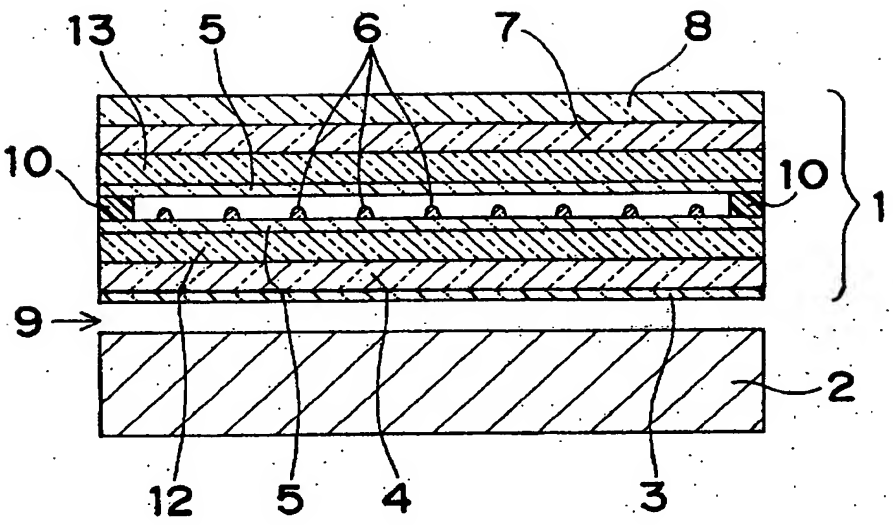
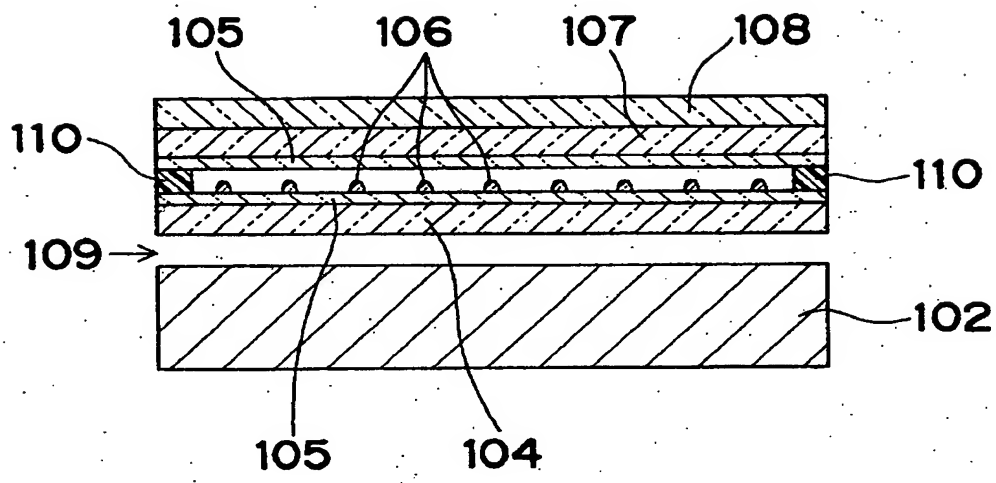


Fig.5



INTERNATIONAL SEARCH REPORT

Internal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06K11/12 G02F1/1335

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 06, 30 April 1998 (1998-04-30) -& JP 10 048625 A (SUMITOMO CHEM CO LTD), 20 February 1998 (1998-02-20) cited in the application abstract	1-5
Y	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 12, 31 October 1998 (1998-10-31) -& JP 10 186136 A (DOWA MINING CO LTD;DOWA VISUAL SYST KK), 14 July 1998 (1998-07-14) abstract -& US 6 020 945 A (SAWAI ET AL.) 1 February 2000 (2000-02-01) column 7, line 1 - line 55	1-5

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Inter nal Application No
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Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 05, 31 May 1999 (1999-05-31) -& JP 11 053114 A (CENTRAL GLASS CO LTD;NIPPON SODA CO LTD), 26 February 1999 (1999-02-26) abstract	1-5
Y	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 08, 30 June 1999 (1999-06-30) & JP 11 085396 A (CENTRAL GLASS CO LTD), 30 March 1999 (1999-03-30) abstract	1-5
Y	EP 0 756 191 A (CANON KK) 29 January 1997 (1997-01-29) column 2, line 42 -column 3, line 3 column 11, line 8 - line 31 column 10, line 50 - line 57; figure 7	1-5
A	EP 0 596 733 A (SHARP KK) 11 May 1994 (1994-05-11) column 8, line 6 - line 35; figures 1,6	1-3

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No
PCT/JP 00/03013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 10048625 A	20-02-1998	NONE	
JP 10186136 A	14-07-1998	US 6020945 A	01-02-2000
JP 11053114 A	26-02-1999	NONE	
JP 11085396 A	30-03-1999	NONE	
EP 0756191 A	29-01-1997	JP 9101518 A US 5847795 A	15-04-1997 08-12-1998
EP 0596733 A	11-05-1994	JP 6148621 A	27-05-1994